Books & arts

A woman's place: at the heart of evolution

The female perspective is often missed in evolutionary tales, but it is at the centre of what makes us human. **By Josie Glausiusz**

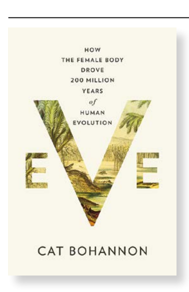
What is a woman? In *Eve*, Cat Bohannon traces the development of female bodies back 200 million years. A writer with a doctorate in the evolution of narrative and cognition, Bohannon offers a refreshing and lively corrective to a story that has focused mainly on male evolution.

"The male body, from mouse to human, is what gets studied in the lab," writes Bohannon. "Unless we're specifically researching ovaries, uteri, estrogens, or breasts, the girls aren't there." Only since 2016 has any US funding agency required grant recipients to use animals of both sexes in experimental studies. And a Google search for "human lineage images" shows only male hominids, often clutching a spear, club or briefcase.

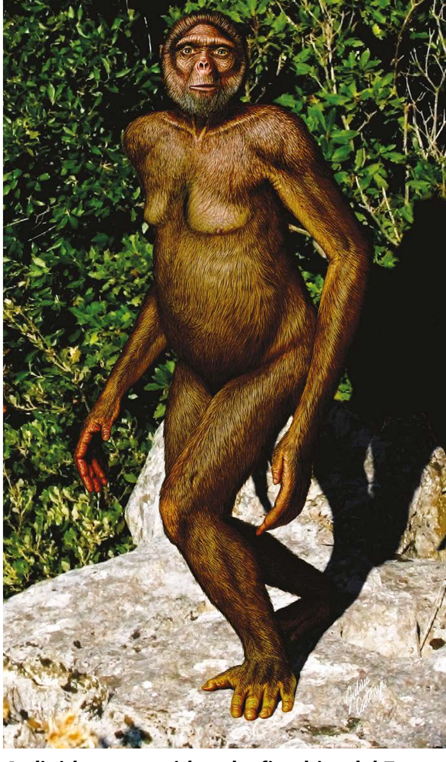
"I realized we needed a kind of user's manual for the female mammal," Bohannon writes. "How our bodies evolved, how they work, what it really means to be a woman." In a fascinating journey, she traces the history of seven 'Eves': the first ancestor to breastfeed, the first to give birth to live young, the first to use tools and so on, up to and including *Homo sapiens*.

The Eves of evolution

Bohannon begins her odyssey with a mouse-sized, egg-laying early mammal called *Morganucodon*, the first of our furry ancestors to feed milk to her offspring. Pattering around under the feet of dinosaurs about 205 million years ago, the insect-eating 'Morgie' – as the author calls her – sweated beads of milk filled with water, sugars and lipids from her skin for her offspring to slurp.



Eve: How the Female Body Drove 200 Million Years of Human Evolution
Cat Bohannon
Knopf/Hutchinson Heinemann (2023)



JULIUS T. CSOTONYI/SPL

***Ardipithecus ramidus*, the first bipedal Eve.**

From Morgie, the narrative leaps tens of millions years forwards to the 'Eve of nipples', most probably an ancestor of marsupials, such as koalas and kangaroos. No more sloshing milk into the void: now the infant's mouth, suckling on a porous, nubbly teat, prompts the release of the protein prolactin and the peptide oxytocin in the mother's brain, triggering milk production in the breast tissue as well as social bonding with her baby.

Next on the scene is "our womb's great-grand-rat", the squirrel-sized 'Donna', and probable ancestor of all placental mammals. *Protungulatum donnae* appeared between 200,000 and 400,000 years after the extinction of non-avian dinosaurs, 66 million years ago. To give birth to live young required huge changes in the reproductive system, as well as the immune system. By carrying the developing embryos inside their bodies, mammals could keep their young at a steady temperature. And without a nest to tend to, the female had more time for foraging and could better protect herself and her young against predation. Within two million to three million years of Donna's appearance, the diversity of placental mammals had exploded.

A perceptive primate

So far, so straightforward. But things get a little murkier when the author focuses on perception and the human brain. Are there real differences between the brains of men and women? Do the sexes perceive the world differently? For answers, Bohannon turns to *Purgatorius*, Earth's earliest known primate.

A "freaky monkey-squirrel", rat-sized and bushy-tailed, 'Purgi' was a tree-climber and fruit-eater. She needed eyes that could see ripening fruit and ears to hear her children in a loud, leafy treescape filled with thrumming insects and cawing birds. Primates such as *Purgatorius* evolved to both hear and produce lower pitches of sound, "to cut through the sonic clutter". Today, men's ears are, on average, better tuned to lower pitches, whereas women's ears tend to be more sensitive to higher ones – usually those above two kilohertz, the standard pitch of a baby's cries.

Women also slightly outperform men in olfactory abilities, and are unlikely to be red–green colour-blind. (The genes that encode opsins, receptors on our retinas that respond to different wavelengths of light, are located on the X chromosome, of which most women have two.) An ability to spot extra-sweet, colourful berries and young green leaves would have benefited female *Purgatorius* during pregnancy and breastfeeding.

From Purgi it's a literal hop, skip and jump through *Ardipithecus ramidus*, the earliest bipedal Eve, moving around on two feet in East Africa 4.4 million years ago, and *Homo*

habilis, the Eve of tools, who first emerged about 2.4 million years ago, to *Homo erectus*, the first Eve to leave Africa around 1.75 million years ago. At each stage of evolution, our ancestors' brain size increased and their prefrontal cortex – which intelligently regulates our thoughts, actions and emotions – in particular "grew and grew".

Bohannon weighs the evidence for putative differences between male and female human brains. "The oddest thing about our species might be that the female human brain doesn't seem to be all that functionally different from the male," she writes. In mathematics, language and other human skills, there's no evidence that men and women are substantially different. Although the female brain is often supposed to be fragile and women "depressive, moody, hysterical", studies show no overall differences in men and women's rates of psychopathology. (Women are about 12% more likely than men to receive treatment for a mental illness, although in some cases, that might be because of diagnosis bias: maybe women seek help more often.)

A natural woman

Bohannon doesn't shy away from the complex question of gender identity. It is our "huge, lumpy, terribly intelligent brain" that produces an experience of identifying as a woman, she says, and not the presence or absence of specific genitalia. "All atypical sexualities and gender identities are fundamentally 'natural'," she writes, "because nothing a body does (including its associated mind, which is itself a product of the body) could ever be unnatural."

"Every single human can be the 'Eve of love' who writes humanity's future."

The nature of what's 'natural' is a topic of her final chapter, 'Love'. As she notes, promiscuity, male domination and sexual coercion all have precedents in the worlds of chimpanzees and ducks. The one distinctively human trait, she writes, is the unusual way that we love each other: "our distinctive, complex, often bizarre and overpowering love bonds, and the way we're able to extend those loving bonds to people we're not related to".

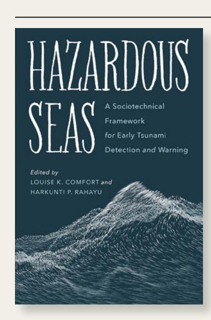
Although other species mate, cheat or mourn, love is what makes us human the most. And every single human can be the 'Eve of love' who writes humanity's future, "in the children we have or help raise and protect" and in the societies in which we live and collaborate. That truly is a beautiful and powerful thought.

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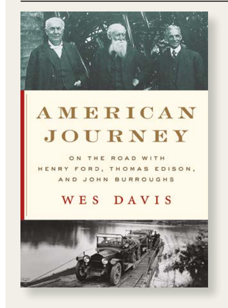
Books in brief



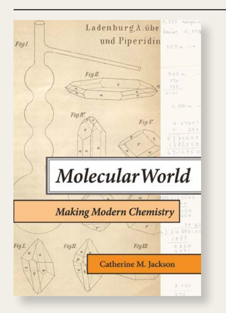
Wasteland
Oliver Franklin-Wallis *Simon & Schuster* (2023)
"Unlike people, garbage doesn't lie," writes journalist Oliver Franklin-Wallis in his disturbingly vivid investigation of waste. The vast trash pile near New Delhi is known locally as Mount Everest. Most UK companies refused to show Franklin-Wallis their landfill sites, yet London — like New York and San Francisco — is built partly on refuse. As for plastics, neither manufacturers nor consumers admit the extent of the disposal problem. Instead of discussing 'plastics', we should understand properties of specific polymers, he recommends.



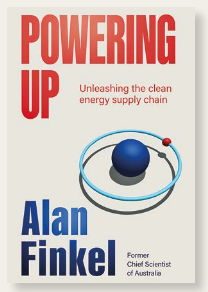
Hazardous Seas
Eds Louise K. Comfort & Harkunti P. Rahayu *Island* (2023)
The 2004 Indian Ocean tsunami — triggered by an earthquake off Sumatra — killed nearly 230,000 people, including around 125,000 Indonesians. It led to an intergovernmental tsunami warning system, with a high false-alarm rate. US disaster-management specialist Louise Comfort and Indonesian planner Harkunti Rahayu describe international collaborations to replace flawed warning devices such as deep-sea buoys with underwater sensors and networks of smartphone communication.



American Journey
Wes Davis *W. W. Norton* (2023)
US industrialist Henry Ford came to know inventor Thomas Edison in 1896, through their shared interest in internal combustion. He encountered John Burroughs in 1912, through an article the naturalist had written apparently disparaging cars. But after sharing a ride in a Ford Model T, Ford and Burroughs developed a lasting friendship. And soon the three enjoyed motorized adventures across the wilds of the United States, guided by the then-elderly Burroughs, as writer Wes Davis describes in this intriguing history full of lively details.



Molecular World
Catherine M. Jackson *MIT Press* (2023)
Eighteenth-century French chemist Antoine Lavoisier defined his field as the science of analysis, epitomized by his introduction of chemical elements. As a result, many historians have stressed the role of theory in organic chemistry. But Catherine Jackson emphasizes experimental reasoning. She focuses on the 1840s laboratory work on the alkaloids by Germans Justus Liebig, August Wilhelm Hofmann and Albert Ladenburg, in which "emergent theories of molecular constitution and structure" remained "tethered to messy reality".



Powering Up
Alan Finkel *Black Inc.* (2023)
Electrical engineer and entrepreneur Alan Finkel, former Australian chief scientist, is inspired by architect Buckminster Fuller's comment: "To change something, build a new model that makes the existing model obsolete." His punchily written book considers how the world can achieve net-zero carbon emissions by creating a new supply chain of materials, markets, government policies and finance to put low-carbon energy technologies into practice. "Petrostates" must be turned into "electrostates", he argues. **Andrew Robinson**